PATENT ABSTRACTS OF JAPAN

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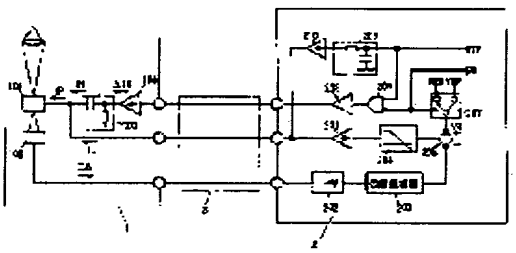
(54) LASER DRIVE DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To transmit faithfully a pulse waveform by providing a high band current supply means supplying a high band component among a drive current to an optical head, a low band current supply means supplying a low band component among the drive current to the head and a substrate connected to the optical head with a cable and adding/synthesizing/supplying the high band, low band components of the drive current to the optical head.
SOLUTION: The output current IL of the low band current drive means 201 provided on the substrate 2 side is supplied to a laser diode 101 through the cable 3 to generate the current according to an input signal. The laser diode 101 emits light at a light quantity according to the current IP (=IL) to illuminate an optical disk medium recording surface. On the other hand, at a recording time, a drive amplifier 208 output signal generates a switching current IH according to a digital pulse signal through the cable 3 by the high band current drive means 104 provided on the optical head 1, and is supplied to the laser diode 101 through a high-pass filter 103 to be superposed on the low band drive current IL.



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CLAIMS

[Claim(s)]
[Claim 1] The drive current which changes to the laser diode prepared in the optical head in the shape of a pulse according to a record signal is supplied. It is the laser driving gear which carries out pulse luminescence with the predetermined quantity of light. On the above-mentioned optical head A high region current supply source means to supply a high-frequency component among the above-mentioned above-mentioned drive currents is established. It is the laser driving gear characterized by establishing a low-pass current supply source means to supply a low-pass component to the substrate connected with the above-mentioned optical head by the cable among the above-mentioned drive currents, carrying out addition composition of the high-frequency component and low-pass component of the above-mentioned drive current in an optical head, and supplying the above-mentioned laser diode.
[Claim 2] The drive current which changes to the laser diode prepared in the optical head in the shape of a pulse according to a record signal is supplied. To the substrate which is the laser driving gear which carries out pulse luminescence with the predetermined quantity of light, and was connected with the above-mentioned optical head by the cable A means to make the above-mentioned record signal transmit to this cable as a parallel signal is established. Moreover, the laser driving gear characterized by having formed a parallel-serial-conversion means to change the above-mentioned parallel signal into a serial signal in the above-mentioned optical head, and forming a current supply source means to make the above-mentioned laser diode emit light in pulse according to the serial signal outputted from the above-mentioned parallel-serial-conversion means in the above-mentioned optical head.
[Claim 3] The laser driving gear according to claim 1 or 2 characterized by establishing on a substrate a means to control the amount of luminescence of laser diode to the specified quantity.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the laser driving gear in a recordable optical disk unit.
[0002]
[Description of the Prior Art] In recent years, the spread of optical disk drives which performs record playback to the optical disk and this in which record like CD-R is possible is remarkable. A laser driving gear is indispensable as a key device in the above-mentioned optical disk drive which supplies a record current pulse to laser diode, controlling the power of laser diode. The conventional laser driving gear is explained briefly below.
[0003] First, if laser diode and the photodiode which acts as the monitor of that amount of luminescence are formed in the optical head and a predetermined laser drive current is passed to this laser diode, laser diode will emit light and a detection current will flow out of a photodiode in proportion to that amount of luminescence. Even if laser diode is sensitive and passes the same drive current to temperature from the first, it emits light with the quantity of light which changes with temperature conditions. Then, feedback control (the so-called laser power control) of the amount of luminescence is carried out using the above-mentioned photodiode output current.
[0004] For example, the above-mentioned feedback current is slushed into resistance, current potential conversion is carried out, and the above-mentioned laser drive current is adjusted according to an error with the potential obtained if this electrical potential difference (monitor electrical potential difference) and target potential, i.e., laser diode, are emitting light with the desired quantity of light. Consequently, in an establishment condition, quantity of light detection potential and target potential become equal, and in other words, feedback control is carried out so that a laser diode may emit light with the desired quantity of light.
[0005] Target potential is suitably switched in playback and each record. That is, when making laser emit light regularly in the amount of tapers comparatively when reproducing information from an optical disk, and recording information on an optical disk, light is made to emit in pulse with the strong quantity of light. Therefore, if possible, target potential is switched to the desired quantity of light each time at the time of record and playback. In addition, at the time of record, sample hold of the peak of the above-mentioned monitor electrical potential difference detected according to pulse luminescence is carried out, this is compared with the above-mentioned target potential, and the power of a pulse luminescence instant is controlled (for example, JP,4-103319,U).
[0006]
[Problem(s) to be Solved by the Invention] However, it was difficult to have prepared almost all components other than laser diode and a photodiode on the substrate besides an optical head, and to have not obtained a colander, but to have made a high speed carry out pulse luminescence especially of the laser diode with the conventional configuration. Namely, in order to realize the above-mentioned laser driving gear which performs highly precise power control, the passive circuit elements of there there are required. In order to slush a drive current into laser diode in addition to it being difficult to arrange on the optical head to which the configuration was restricted, a drive current source is required. Since this drive current source is the great power consumption of itself, it generates heat, and degradation of an optical-axis gap of an optical head etc. with the passage of time arises by this, and the problem that the life of laser diode is shrunken further arises.
[0007] Therefore, although most circuits including the above-mentioned drive current source must be prepared on the independent substrate, when preparing the above-mentioned circuit out of an optical head,

the laser diode and photodiode on an optical head must be connected by the long cable. That is, generally, although the optical head is prepared on the migration (traverse) motor and it can move to arbitration over an optical disk inside-and-outside periphery, since the physical relationship of the above-mentioned substrate and an optical head will always change, the cable which connects both needs sufficiently generous die length. For example, in the case of a CD-R drive, about 10cm is needed.

[0008] However, in order to make laser diode emit light by predetermined power, an about 100mA high current is required, and with the further above-mentioned configuration, since a pulse-like switching current will be supplied to laser diode through the above-mentioned cable from a drive current source in case information is recorded on an optical disk, it becomes so difficult that it becomes a high speed with the capacity and the induction property of a cable to transmit pulse shape faithfully.

[0009]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the laser driving gear of invention of claim 1 The drive current which changes to the laser diode prepared in the optical head in the shape of a pulse according to a record signal is supplied. It is the laser driving gear which carries out pulse luminescence with the predetermined quantity of light. On the above-mentioned optical head A high region current supply source means to supply a high-frequency component among the above-mentioned above-mentioned drive currents is established. It is characterized by establishing a low-pass current supply source means to supply a low-pass component to the substrate connected with the above-mentioned optical head by the cable among the above-mentioned drive currents, carrying out addition composition of the high-frequency component and low-pass component of the above-mentioned drive current in an optical head, and supplying the above-mentioned laser diode.

[0010] Invention of claim 2 to moreover, the laser diode prepared in the optical head It is the laser driving gear which supplies the drive current which changes in the shape of a pulse according to a record signal, and carries out pulse luminescence with the predetermined quantity of light. A means to make this cable transmit the above-mentioned record signal to the substrate connected with the above-mentioned optical head by the cable as a parallel signal is established. Moreover, it is characterized by having formed a parallel-serial-conversion means to change the above-mentioned parallel signal into a serial signal in the above-mentioned optical head, and forming a current supply source means to make the above-mentioned laser diode emit light in pulse according to the serial signal outputted from the above-mentioned parallel-serial-conversion means in the above-mentioned optical head.

[0011]

[Embodiment of the Invention] Hereafter, the operation gestalt of invention of claim 1 is explained. Drawing 1 is the block diagram of the operation gestalt of invention of claim 1. In drawing 1 , laser diode 101 and a photodiode 102 are further formed for the high region current driving means 104 and the high-pass filter 103 on the optical head 1. On the substrate 2, the component of low-pass current driving means 201 and others is prepared. The optical head 1 and the substrate 2 are connected by the cable 3. Although not illustrated especially, the optical head 1 has composition which can move to arbitration over an optical disk inside-and-outside periphery by the traverse motor.

[0012] First, the function to make laser emit light regularly at the time (RW=L) of playback is explained. The output current IL of the low-pass current driving means 201 prepared in the substrate side is supplied to laser diode 101 through a cable 3. The low-pass current driving means 201 generates the current according to an input signal, for example, is constituted here by the bipolar component with an open collector output etc. A laser diode 101 emits light with the quantity of light according to Current IP (=IL), and illuminates an optical disk medium recording surface. Current conversion is carried out with a photodiode 102, and a part of luminescence is changed into an electrical potential difference (monitor electrical potential difference) by the current potential converter 202 prepared on the substrate 2 through the cable 3 as a quantity of light detection current IB. A monitor electrical potential difference is compared by the target potential VR (potential equal to the monitor electrical potential difference obtained if laser diode is emitting light with the desired quantity of light), and the error operation means 205 through the envelope detector 203, and the amount of the error returns to the low-pass current driving means 201 through a loop filter 204. As a result in a steady state, quantity of light detection potential and target potential become equal, and laser diode emits light with the desired quantity of light. A loop filter 201 usually consists of active filters with the primary integral property etc.

[0013] Digital pulse signal DTP in which the record gate 206 included the information which should be opened and recorded on the other hand at the time (RW=H) of record is supplied to the drive amplifier 208 from a modulator. The drive amplifier 208 is amplifier of the voltage output which consisted of for example, CMOS switching devices etc. Drive amplifier 208 output signal is supplied to the high region current driving

means 104 established on the optical head 1 through a cable 3. The high region current driving means 104 generates the switching current IH according to a digital pulse signal, i.e., a high region drive current, and this current is supplied to laser diode 101 through a high-pass filter 103. Since the low-pass drive current IL is already supplied to laser diode, Current IH will be superimposed by this.

[0014] Furthermore, digital pulse signal DTP is supplied to the low-pass current driving means 210 through the low pass filter 209 with the same cut off frequency as a high-pass filter 103, and the current output is superimposed on low-pass current driving means 201 current output, serves as the low-pass drive current IL, and is supplied to laser diode 101.

[0015] A situation in case this operation gestalt changes from playback actuation to record actuation or playback actuation from record actuation is shown in drawing 2 . Immediately after the high region drive current IH after high-pass filter 103 passage starts record actuation, although it starts predetermined current deltaIH from **0 [ampere], since the low-pass component including a direct current is cut, if time amount is formed, it will become alternating current which changes in **deltaIH/2 according to digital pulse signal DTP. On the other hand, from the low-pass current driving means 210, the current according to the low-pass component of digital pulse signal DTP is outputted. In other words, a current with which the low-pass current component of digital pulse signal DTP cut with the high-pass filter 103 is compensated is supplied. The current IP (= IH+IL) supplied to laser diode 101 as a result becomes that (IW) by which pulse current component deltaIH corresponding to a digital pulse signal was added to a direct current at the time of playback (IR) so that it may be illustrated, laser will carry out high-power luminescence in pulse, and record will be performed to an optical disk medium.

[0016] The current IB according to the amount of luminescence at this time is detected by the photodiode 102, and after this current IB is transformed into a monitor voltage signal by the current potential converter 202, that envelope ******** envelope is detected by the envelope detection means 203. Here, the envelope detection means 203 is realized by the circuit which carries out sample hold of the peak value according to the edge of the rectifier circuit or digital pulse signal DTP which used diode. Although envelope detection means 203 output signal is compared with desired value VR by the error detection means 205, this desired value changes to VRRVRE in the time (RW=L) of playback and record (RW=H) with the desired value change means 207, respectively. That is, feedback control to which it is predetermined low power, and is high power predetermined in a pulse peak at the time of record at the time of playback, and laser diode emits light is performed.

[0017] Hereafter, it explains, referring to drawing 3 about the effectiveness of this operation gestalt. Drawing 3 is the current-luminescence power characteristics of laser diode 101. Laser diode 101 does not necessarily emit light according to the current always supplied, and unless it exceeds a threshold current (ITH), it does not emit light. That is, if it carries out from a practical viewpoint, a threshold current will be only what contributes to generation of heat as power is only consumed that is,. With this operation gestalt, it supplies from the low-pass current driving means 201 and 210 in which the low-pass current IL including this threshold current ITH was formed at the substrate 2 side. Specifically, a low-pass current value is about 50mA. Although pulse current is further poured in at the time of record and high-power luminescence of the laser diode is carried out in instant, the high region current driving means 105 established on the head 1 supplies only current increment delta IH required for this. Specifically, current increment deltaIH is about 20mA. In other words, it is only that the high region current driving means 104 only consumes an added current, and generation of heat of the optical head 1 is suppressed to the minimum by having formed only the high region current driving means 104 in the optical head 1 side.

[0018] Furthermore, needless to say, according to this operation gestalt, since the high-speed pulse current at the time of record is directly supplied from the high region current driving means 104 close to laser diode, it can carry out high-speed pulse luminescence of the laser diode, maintaining pulse shape, even if the record frequency became high.

[0019] A recording rate can be raised easily, without raising the temperature of an optical head too much as mentioned above according to this operation gestalt.

[0020] In addition, in this operation gestalt, although laser power control at the time of playback and record shall be performed by only changing desired value VR using a single control system, the effectiveness of this invention is not limited to this. For example, the control system which controls stationary luminescence at the time of playback, and the control system which performs the pulse control at the time of record may be established independently. Moreover, a control system may be made into a HOLD status at the time of record.

[0021] Moreover, in this operation gestalt, although the change of laser power was only made into two steps at the time of playback and record, in the case of the erasable optical disk unit using a phase change

medium, the three-stage change which added elimination power further is required. However, the high-frequency component and low-pass component of a laser drive current signal are separated in such cases, the configuration of this operation gestalt of establishing only a high region current driving means on an optical head is possible, and effectiveness equivalent to this operation gestalt should be acquired.
[0022] The operation gestalt of invention of claim 2 is explained below. Drawing 4 is the block diagram of the laser driving gear of invention of claim 2. In drawing 4 , laser diode 101, a photodiode 102, a high-pass filter 103, the high region current driving means 104, the low-pass current driving means 201 and 210, the current potential converter 202, the envelope detection means 203, a loop filter 204, the error operation means 205, the record gate 206, the desired value means for switching 207, and a low pass filter 209 have a function equivalent to what was shown by drawing 1 . Differing by this example is to have formed the serial parallel converter 221 and the clock counting-down circuit 222 on the substrate 20, and have formed the parallel-serial-conversion machine 111 and the clock multiplier 112 on the head 10.
[0023] With the operation gestalt of point **, although a laser diode 101 is not driven through a cable since the high region current driving means 104 supplies the pulse component of a laser drive current, the load capacity which can drive a cable by high frequency at least is required for the drive amplifier 208 in drawing 1 . So, in this example, by carrying out the parallel transfer of the record signal, the transfer frequency per line was lowered and the load is mitigated substantially. Digital pulse signal DTP is permuted with 4-bit parallel data by the serial parallel converter 221. Moreover, 4 dividing of clocks CLK is carried out by the clock counting-down circuit 222. On a cable 30, the data with which the frequency was set to one fourth pass. On the other hand, in a head 10, the parallel-serial-conversion machine 111 changes the above-mentioned 4-bit parallel data into a serial, and the high region current driving means 104 is supplied. The clock which conversion takes carries out 4 multiplying of the above-mentioned 4 dividing clock with the clock multiplier 112, and is obtained.
[0024] The clock multiplier 112 consists of PLL circuits for example, with 4 dividing counter. Generally the above-mentioned parallel-serial-conversion machine 111 and the clock multiplier 112 (PLL) can be constituted from a small-scale CMOS digital circuit. As the previous operation gestalt furthermore also described, since the high region current driving means 104 only supplies a switching (alternating current) current, the need of being the constant current source of a bipolar configuration like the low-pass current driving means 201 does not have it. Therefore, if this is constituted from a CMOS switching element and it IC-izes with the above-mentioned parallel-serial-conversion machine 11 and the clock multiplier 112, it will become sufficiently possible to prepare in the tooth space to which it was restricted on the head 10.
[0025] As mentioned above, according to this operation gestalt, the frequency of the signal which passes a cable 30 can be reduced and the effective load of a cable can be mitigated. Consequently, it becomes possible to record a still more nearly high-speed signal.
[0026] In addition, in this example, when serial digital pulse signal DTP is changed into juxtaposition, it is, but since digital data is processed by juxtaposition of 8 bitwises from the first, a serial parallel conversion may not be carried out specially, but ** may also output parallel data as it is. However, the parallel-serial-conversion machine 111 on the optical head 10 is required also in this case.
[0027]
[Effect of the Invention] It becomes possible to gather a recording rate, suppressing the temperature rise of an optical head as mentioned above to the minimum by establishing a low-pass current driving means, respectively on the substrate with which the high region current driving means was connected with the optical head and the cable on the optical head, and having supplied the current according to the low-pass component and high-frequency component of a digital pulse signal which each should record on an optical disk medium according to invention of claim 1.
[0028] Moreover, according to invention of claim 2, the frequency of the signal which transmits the above-mentioned cable can be reduced, and it becomes possible to gather a recording rate further.

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TECHNICAL FIELD

[Field of the Invention] This invention relates to the laser driving gear in a recordable optical disk unit.

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PRIOR ART

[Description of the Prior Art] In recent years, the spread of optical disk drives which performs record playback to the optical disk and this in which record like CD-R is possible is remarkable. A laser driving gear is indispensable as a key device in the above-mentioned optical disk drive which supplies a record current pulse to laser diode, controlling the power of laser diode. The conventional laser driving gear is explained briefly below.
[0003] First, if laser diode and the photodiode which acts as the monitor of that amount of luminescence are formed in the optical head and a predetermined laser drive current is passed to this laser diode, laser diode will emit light and a detection current will flow out of a photodiode in proportion to that amount of luminescence. Even if laser diode is sensitive and passes the same drive current to temperature from the first, it emits light with the quantity of light which changes with temperature conditions. Then, feedback control (the so-called laser power control) of the amount of luminescence is carried out using the above-mentioned photodiode output current.
[0004] For example, the above-mentioned feedback current is slushed into resistance, current potential conversion is carried out, and the above-mentioned laser drive current is adjusted according to an error with the potential obtained if this electrical potential difference (monitor electrical potential difference) and target potential, i.e., laser diode, are emitting light with the desired quantity of light. Consequently, in an establishment condition, quantity of light detection potential and target potential become equal, and in other words, feedback control is carried out so that a laser diode may emit light with the desired quantity of light.
[0005] Target potential is suitably switched in playback and each record. That is, when making laser emit light regularly in the amount of tapers comparatively when reproducing information from an optical disk, and recording information on an optical disk, light is made to emit in pulse with the strong quantity of light. Therefore, if possible, target potential is switched to the desired quantity of light each time at the time of record and playback. In addition, at the time of record, sample hold of the peak of the above-mentioned monitor electrical potential difference detected according to pulse luminescence is carried out, this is compared with the above-mentioned target potential, and the power of a pulse luminescence instant is controlled (for example, JP,4-103319,U).

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EFFECT OF THE INVENTION

[Effect of the Invention] It becomes possible to gather a recording rate, suppressing the temperature rise of an optical head as mentioned above to the minimum by establishing a low-pass current driving means, respectively on the substrate with which the high region current driving means was connected with the optical head and the cable on the optical head, and having supplied the current according to the low-pass component and high-frequency component of a digital pulse signal which each should record on an optical disk medium according to invention of claim 1.
[0028] Moreover, according to invention of claim 2, the frequency of the signal which transmits the above-mentioned cable can be reduced, and it becomes possible to gather a recording rate further.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, it was difficult to have prepared almost all components other than laser diode and a photodiode on the substrate besides an optical head, and to have not obtained a colander, but to have made a high speed carry out pulse luminescence especially of the laser diode with the conventional configuration. Namely, in order to realize the above-mentioned laser driving gear which performs highly precise power control, the passive circuit elements of there there are required. In order to slush a drive current into laser diode in addition to it being difficult to arrange on the optical head to which the configuration was restricted, a drive current source is required. Since this drive current source is the great power consumption of itself, it generates heat, and degradation of an optical-axis gap of an optical head etc. with the passage of time arises by this, and the problem that the life of laser diode is shrunken further arises.
[0007] Therefore, although most circuits including the above-mentioned drive current source must be prepared on the independent substrate, when preparing the above-mentioned circuit out of an optical head, the laser diode and photodiode on an optical head must be connected by the long cable. That is, generally, although the optical head is prepared on the migration (traverse) motor and it can move to arbitration over an optical disk inside-and-outside periphery, since the physical relationship of the above-mentioned substrate and an optical head will always change, the cable which connects both needs sufficiently generous die length. For example, in the case of a CD-R drive, about 10cm is needed.
[0008] However, in order to make laser diode emit light by predetermined power, an about 100mA high current is required, and with the further above-mentioned configuration, since a pulse-like switching current will be supplied to laser diode through the above-mentioned cable from a drive current source in case information is recorded on an optical disk, it becomes so difficult that it becomes a high speed with the capacity and the induction property of a cable to transmit pulse shape faithfully.

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MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the laser driving gear of invention of claim 1 The drive current which changes to the laser diode prepared in the optical head in the shape of a pulse according to a record signal is supplied. It is the laser driving gear which carries out pulse luminescence with the predetermined quantity of light. On the above-mentioned optical head A high region current supply source means to supply a high-frequency component among the above-mentioned above-mentioned drive currents is established. It is characterized by establishing a low-pass current supply source means to supply a low-pass component to the substrate connected with the above-mentioned optical head by the cable among the above-mentioned drive currents, carrying out addition composition of the high-frequency component and low-pass component of the above-mentioned drive current in an optical head, and supplying the above-mentioned laser diode.
[0010] Invention of claim 2 to moreover, the laser diode prepared in the optical head It is the laser driving gear which supplies the drive current which changes in the shape of a pulse according to a record signal, and carries out pulse luminescence with the predetermined quantity of light. A means to make this cable transmit the above-mentioned record signal to the substrate connected with the above-mentioned optical head by the cable as a parallel signal is established. Moreover, it is characterized by having formed a parallel-serial-conversion means to change the above-mentioned parallel signal into a serial signal in the above-mentioned optical head, and forming a current supply source means to make the above-mentioned laser diode emit light in pulse according to the serial signal outputted from the above-mentioned parallel-serial-conversion means in the above-mentioned optical head.
[0011]
[Embodiment of the Invention] Hereafter, the operation gestalt of invention of claim 1 is explained. Drawing 1 is the block diagram of the operation gestalt of invention of claim 1. In drawing 1 , laser diode 101 and a photodiode 102 are further formed for the high region current driving means 104 and the high-pass filter 103 on the optical head 1. On the substrate 2, the component of low-pass current driving means 201 and others is prepared. The optical head 1 and the substrate 2 are connected by the cable 3. Although not illustrated especially, the optical head 1 has composition which can move to arbitration over an optical disk inside-and-outside periphery by the traverse motor.
[0012] First, the function to make laser emit light regularly at the time (RW=L) of playback is explained. The output current IL of the low-pass current driving means 201 prepared in the substrate side is supplied to laser diode 101 through a cable 3. The low-pass current driving means 201 generates the current according to an input signal, for example, is constituted here by the bipolar component with an open collector output etc. A laser diode 101 emits light with the quantity of light according to Current IP (=IL), and illuminates an optical disk medium recording surface. Current conversion is carried out with a photodiode 102, and a part of luminescence is changed into an electrical potential difference (monitor electrical potential difference) by the current potential converter 202 prepared on the substrate 2 through the cable 3 as a quantity of light detection current IB. A monitor electrical potential difference is compared by the target potential VR (potential equal to the monitor electrical potential difference obtained if laser diode is emitting light with the desired quantity of light), and the error operation means 205 through the envelope detector 203, and the amount of the error returns to the low-pass current driving means 201 through a loop filter 204. As a result in a steady state, quantity of light detection potential and target potential become equal, and laser diode emits light with the desired quantity of light. A loop filter 201 usually consists of active filters with the primary integral property etc.
[0013] Digital pulse signal DTP in which the record gate 206 included the information which should be opened and recorded on the other hand at the time (RW=H) of record is supplied to the drive amplifier 208

from a modulator. The drive amplifier 208 is amplifier of the voltage output which consisted of for example, CMOS switching devices etc. Drive amplifier 208 output signal is supplied to the high region current driving means 104 established on the optical head 1 through a cable 3. The high region current driving means 104 generates the switching current IH according to a digital pulse signal, i.e., a high region drive current, and this current is supplied to laser diode 101 through a high-pass filter 103. Since the low-pass drive current IL is already supplied to laser diode, Current IH will be superimposed by this.

[0014] Furthermore, digital pulse signal DTP is supplied to the low-pass current driving means 210 through the low pass filter 209 with the same cut off frequency as a high-pass filter 103, and the current output is superimposed on low-pass current driving means 201 current output, serves as the low-pass drive current IL, and is supplied to laser diode 101.

[0015] A situation in case this operation gestalt changes from playback actuation to record actuation or playback actuation from record actuation is shown in drawing 2 . Immediately after the high region drive current IH after high-pass filter 103 passage starts record actuation, although it starts predetermined current deltaIH from **0 [ampere], since the low-pass component including a direct current is cut, if time amount is formed, it will become alternating current which changes in **deltaIH/2 according to digital pulse signal DTP. On the other hand, from the low-pass current driving means 210, the current according to the low-pass component of digital pulse signal DTP is outputted. In other words, a current with which the low-pass current component of digital pulse signal DTP cut with the high-pass filter 103 is compensated is supplied. The current IP (= IH+IL) supplied to laser diode 101 as a result becomes that (IW) by which pulse current component deltaIH corresponding to a digital pulse signal was added to a direct current at the time of playback (IR) so that it may be illustrated, laser will carry out high-power luminescence in pulse, and record will be performed to an optical disk medium.

[0016] The current IB according to the amount of luminescence at this time is detected by the photodiode 102, and after this current IB is transformed into a monitor voltage signal by the current potential converter 202, that envelope ******** envelope is detected by the envelope detection means 203. Here, the envelope detection means 203 is realized by the circuit which carries out sample hold of the peak value according to the edge of the rectifier circuit or digital pulse signal DTP which used diode. Although envelope detection means 203 output signal is compared with desired value VR by the error detection means 205, this desired value changes to VRRVRE in the time (RW=L) of playback and record (RW=H) with the desired value change means 207, respectively. That is, feedback control to which it is predetermined low power, and is high power predetermined in a pulse peak at the time of record at the time of playback, and laser diode emits light is performed.

[0017] Hereafter, it explains, referring to drawing 3 about the effectiveness of this operation gestalt. Drawing 3 is the current-luminescence power characteristics of laser diode 101. Laser diode 101 does not necessarily emit light according to the current always supplied, and unless it exceeds a threshold current (ITH), it does not emit light. That is, if it carries out from a practical viewpoint, a threshold current will be only what contributes to generation of heat as power is only consumed that is,. With this operation gestalt, it supplies from the low-pass current driving means 201 and 210 in which the low-pass current IL including this threshold current ITH was formed at the substrate 2 side. Specifically, a low-pass current value is about 50mA. Although pulse current is further poured in at the time of record and high-power luminescence of the laser diode is carried out in instant, the high region current driving means 105 established on the head 1 supplies only current increment delta IH required for this. Specifically, current increment deltaIH is about 20mA. In other words, it is only that the high region current driving means 104 only consumes an added current, and generation of heat of the optical head 1 is suppressed to the minimum by having formed only the high region current driving means 104 in the optical head 1 side.

[0018] Furthermore, needless to say, according to this operation gestalt, since the high-speed pulse current at the time of record is directly supplied from the high region current driving means 104 close to laser diode, it can carry out high-speed pulse luminescence of the laser diode, maintaining pulse shape, even if the record frequency became high.

[0019] A recording rate can be raised easily, without raising the temperature of an optical head too much as mentioned above according to this operation gestalt.

[0020] In addition, in this operation gestalt, although laser power control at the time of playback and record shall be performed by only changing desired value VR using a single control system, the effectiveness of this invention is not limited to this. For example, the control system which controls stationary luminescence at the time of playback, and the control system which performs the pulse control at the time of record may be established independently. Moreover, a control system may be made into a HOLD status at the time of record.

[0021] Moreover, in this operation gestalt, although the change of laser power was only made into two steps at the time of playback and record, in the case of the erasable optical disk unit using a phase change medium, the three-stage change which added elimination power further is required. However, the high-frequency component and low-pass component of a laser drive current signal are separated in such cases, the configuration of this operation gestalt of establishing only a high region current driving means on an optical head is possible, and effectiveness equivalent to this operation gestalt should be acquired.
[0022] The operation gestalt of invention of claim 2 is explained below. Drawing 4 is the block diagram of the laser driving gear of invention of claim 2. In drawing 4 , laser diode 101, a photodiode 102, a high-pass filter 103, the high region current driving means 104, the low-pass current driving means 201 and 210, the current potential converter 202, the envelope detection means 203, a loop filter 204, the error operation means 205, the record gate 206, the desired value means for switching 207, and a low pass filter 209 have a function equivalent to what was shown by drawing 1 . Differing by this example is to have formed the serial parallel converter 221 and the clock counting-down circuit 222 on the substrate 20, and have formed the parallel-serial-conversion machine 111 and the clock multiplier 112 on the head 10.
[0023] With the operation gestalt of point **, although a laser diode 101 is not driven through a cable since the high region current driving means 104 supplies the pulse component of a laser drive current, the load capacity which can drive a cable by high frequency at least is required for the drive amplifier 208 in drawing 1 . So, in this example, by carrying out the parallel transfer of the record signal, the transfer frequency per line was lowered and the load is mitigated substantially. Digital pulse signal DTP is permuted with 4-bit parallel data by the serial parallel converter 221. Moreover, 4 dividing of clocks CLK is carried out by the clock counting-down circuit 222. On a cable 30, the data with which the frequency was set to one fourth pass. On the other hand, in a head 10, the parallel-serial-conversion machine 111 changes the above-mentioned 4-bit parallel data into a serial, and the high region current driving means 104 is supplied. The clock which conversion takes carries out 4 multiplying of the above-mentioned 4 dividing clock with the clock multiplier 112, and is obtained.
[0024] The clock multiplier 112 consists of PLL circuits for example, with 4 dividing counter. Generally the above-mentioned parallel-serial-conversion machine 111 and the clock multiplier 112 (PLL) can be constituted from a small-scale CMOS digital circuit. As the previous operation gestalt furthermore also described, since the high region current driving means 104 only supplies a switching (alternating current) current, the need of being the constant current source of a bipolar configuration like the low-pass current driving means 201 does not have it. Therefore, if this is constituted from a CMOS switching element and it IC-izes with the above-mentioned parallel-serial-conversion machine 11 and the clock multiplier 112, it will become sufficiently possible to prepare in the tooth space to which it was restricted on the head 10.
[0025] As mentioned above, according to this operation gestalt, the frequency of the signal which passes a cable 30 can be reduced and the effective load of a cable can be mitigated. Consequently, it becomes possible to record a still more nearly high-speed signal.
[0026] In addition, in this example, when serial digital pulse signal DTP is changed into juxtaposition, it is, but since digital data is processed by juxtaposition of 8 bitwises from the first, a serial parallel conversion may not be carried out specially, but ** may also output parallel data as it is. However, the parallel-serial-conversion machine 111 on the optical head 10 is required also in this case.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block diagram of the 1st example of this invention
[Drawing 2] The timing chart which shows actuation of the 1st example of this invention
[Drawing 3] The property Fig. showing the effectiveness of the 1st example of this invention
[Drawing 4] The block diagram of the 2nd example of this invention
[Description of Notations]
1 Ten Optical head
2 20 Substrate
3 30 Cable
101 Laser Diode
102 Photodiode
103 High-pass Filter
104 High Region Current Driving Means
111 Parallel-Serial-Conversion Machine
112 Clock Multiplier
201,210 Low-pass current driving means
202 Current Potential Converter
203 Crash Line Detection Means
204 Loop Filter
209 Low Pass Filter
221 Serial Parallel Converter
222 Clock Counting-down Circuit

[Translation done.]

* NOTICES *

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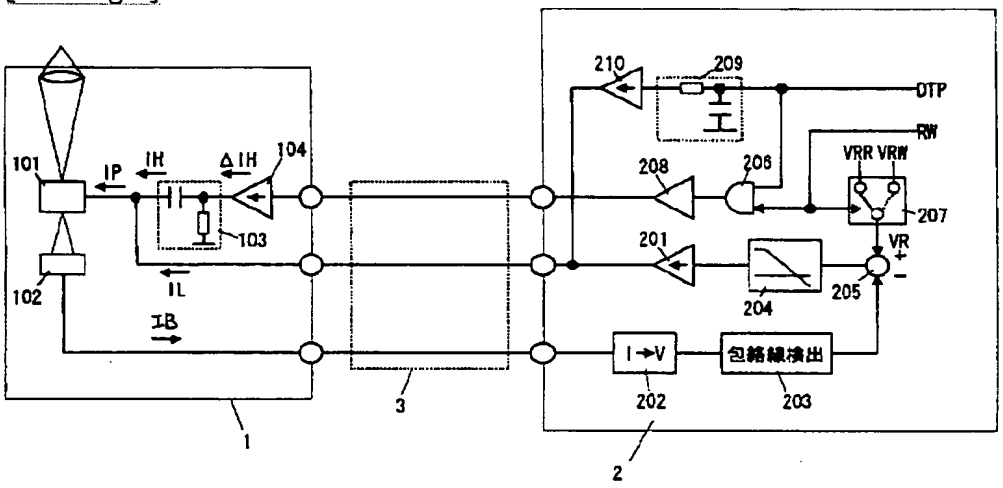
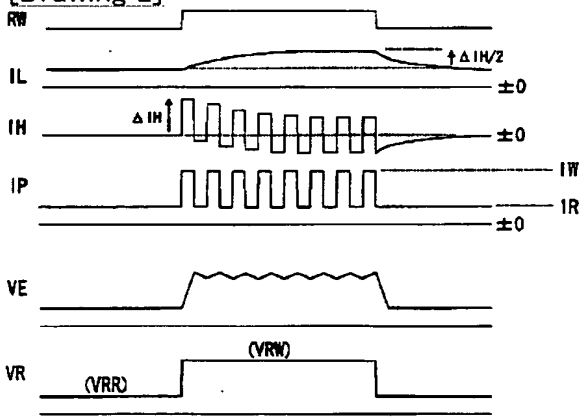
DRAWINGS

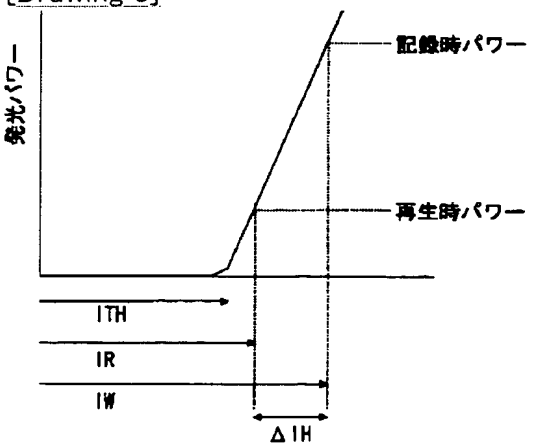
[Drawing 1]



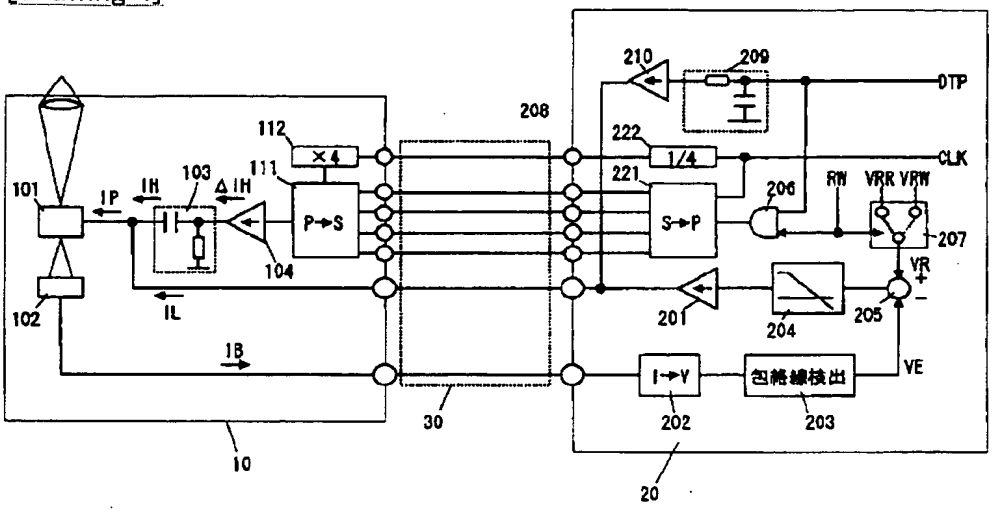
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]

* NOTICES *

CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law
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G11B 33/12
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G11B 7/00 L
G11B 7/00 S
G11B 7/08 Z
G11B 33/12 313 D
G11B 33/14 K

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[Filing Date] October 5, Heisei 16 (2004. 10.5)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[The contents of amendment]
[Claim(s)]
[Claim 1]
It is the laser driving gear which supplies the drive current which changes to the laser diode prepared in the optical head in the shape of a pulse according to a record signal, and carries out pulse luminescence with the predetermined quantity of light,
The laser driving gear characterized by establishing the 2nd current supply source means which supplies other currents for the 1st current supply source means which supplies a part among the above-mentioned drive currents to the above-mentioned optical head out of the above-mentioned head, respectively.
[Claim 2]
It is the laser driving gear which supplies the drive current which changes to the laser diode prepared in the optical head in the shape of a pulse according to a record signal, and carries out pulse luminescence with the predetermined quantity of light,
A high region current supply source means to supply the current which includes a high-frequency component among the above-mentioned drive currents is formed in the above-mentioned optical head,
A low-pass current supply source means to supply the current which contains a low-pass component in

the above-mentioned optical head among the above-mentioned drive currents through a cable is established out of the above-mentioned head,
A current including the high-frequency component of the above-mentioned drive current and the current containing a low-pass component are a laser driving gear characterized by being compounded in an optical head and supplying the above-mentioned laser diode.
[Claim 3]
The current in which a current including a high-frequency component contains a low-pass component through a high-pass filter is a laser driving gear according to claim 2 characterized by being supplied, respectively through a low pass filter.
[Claim 4]
The current containing a low-pass component is a laser driving gear according to claim 3 characterized by generating the above-mentioned high-pass filter with a low pass filter with the same cut off frequency.
[Claim 5]
It is the laser driving gear which supplies the drive current which changes to the laser diode prepared in the optical head in the shape of a pulse according to a record signal, and carries out pulse luminescence with the predetermined quantity of light,
A means to make this cable transmit the above-mentioned record signal to the substrate connected with the above-mentioned optical head by the cable as a parallel signal is established,
Moreover, a parallel-serial-conversion means to change the above-mentioned parallel signal into a serial signal is formed in the above-mentioned optical head,
The laser driving gear characterized by forming a current supply source means to make the above-mentioned laser diode emit light in pulse according to the serial signal outputted from the above-mentioned parallel-serial-conversion means in the above-mentioned optical head.
[Claim 6]
The laser driving gear according to claim 1, 2, or 5 characterized by establishing a means to control the amount of luminescence of laser diode to the specified quantity, out of a head.
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] 0009
[Method of Amendment] Modification
[The contents of amendment]
[0009]
[Means for Solving the Problem]
In order to solve the above-mentioned technical problem, the laser driving gear of invention of claim 1 supplies the drive current which changes to the laser diode prepared in the optical head in the shape of a pulse according to a record signal. It is the laser driving gear which carries out pulse luminescence with the predetermined quantity of light, and is characterized by establishing the 2nd current supply source means which supplies other currents for the 1st current supply source means which supplies a part among the above-mentioned drive currents to the above-mentioned optical head out of the above-mentioned head, respectively.
Invention of claim 2 to moreover, the laser diode prepared in the optical head It is the laser driving gear which supplies the drive current which changes in the shape of a pulse according to a record signal, and carries out pulse luminescence with the predetermined quantity of light. A high region current supply source means to supply the current which includes a high-frequency component among the above-mentioned drive currents is formed in the above-mentioned optical head. A low-pass current supply source means to supply the current which contains a low-pass component in the above-mentioned optical head among the above-mentioned drive currents through a cable is established out of the above-mentioned head. It is characterized by compounding a current including the high-frequency component of the above-mentioned drive current, and the current containing a low-pass component in an optical head, and supplying them to the above-mentioned laser diode.
[Procedure amendment 3]
[Document to be Amended] Specification
[Item(s) to be Amended] 0010
[Method of Amendment] Modification
[The contents of amendment]
[0010]
Invention of claim 5 to moreover, the laser diode prepared in the optical head It is the laser driving gear

which supplies the drive current which changes in the shape of a pulse according to a record signal, and carries out pulse luminescence with the predetermined quantity of light. A means to make this cable transmit the above-mentioned record signal to the substrate connected with the above-mentioned optical head by the cable as a parallel signal is established. Moreover, it is characterized by having formed a parallel-serial-conversion means to change the above-mentioned parallel signal into a serial signal in the above-mentioned optical head, and forming a current supply source means to make the above-mentioned laser diode emit light in pulse according to the serial signal outputted from the above-mentioned parallel-serial-conversion means in the above-mentioned optical head.

[Procedure amendment 4]

[Document to be Amended] Specification

[Item(s) to be Amended] 0011

[Method of Amendment] Modification

[The contents of amendment]

[0011]

[Embodiment of the Invention]

Hereafter, the operation gestalt of invention of claim 1 is explained. Drawing 1 is the block diagram of the operation gestalt of invention of claim 1. In drawing 1, laser diode 101 and a photodiode 102 are further formed for high region current drive **** 104 and a high-pass filter as 1st current supply source means on the optical head 1. On the substrate 2, the component of low-pass current drive **** 201 and others is prepared as 2nd current supply source means. The optical head 1 and the substrate 2 are connected by the cable 3. Although not illustrated especially, the optical head 1 has composition which can move to arbitration over an optical disk inside-and-outside periphery by the traverse motor.

[Translation done.]

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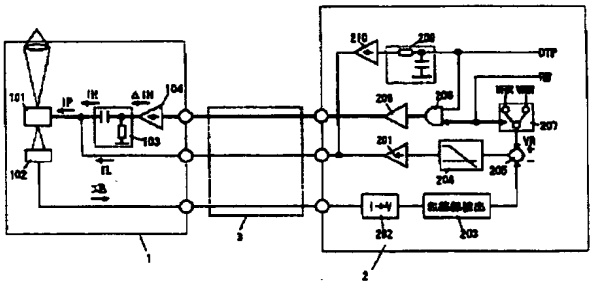
(54)【発明の名称】　レーザー駆動装置

(57)【要約】

【課題】　レーザを駆動する駆動電流源からパルス波形を忠実に高速にレーザに伝送する。

【解決手段】　基板上に低域電流駆動手段を、光ヘッド上に高域電流駆動手段を設け、それぞれが光ディスク媒体に記録すべきデジタルパルス信号の低域成分および高域成分（それぞれ同一カットオフ周波数のローパスフィルタおよびハイパスフィルタで分離）に応じた電流を供給するようにした。



1

【特許請求の範囲】
【請求項１】光ヘッドに設けられたレーザーダイオードに、記録信号に応じてパルス状に変化する駆動電流を供給し、所定の光量でパルス発光させるレーザー駆動装置であって、
上記光ヘッドに、上記上記駆動電流のうち高域成分を供給する高域電流供給手段を設け、
上記光ヘッドとケーブルで接続された基板に、上記駆動電流のうち低域成分を供給する低域電流供給手段を設け、
上記駆動電流の高域成分と低域成分は光ヘッドにおいて加算合成され上記レーザーダイオードに供給されることを特徴とするレーザー駆動装置。
【請求項２】光ヘッドに設けられたレーザーダイオードに、記録信号に応じてパルス状に変化する駆動電流を供給し、所定の光量でパルス発光させるレーザー駆動装置であって、
上記光ヘッドとケーブルで接続された基板に、このケーブルに上記記録信号を並列信号として伝送させる手段を設け、
また、上記並列信号を直列信号に変換する並列直列変換手段を上記光ヘッドに設け、
上記並列直列変換手段より出力される直列信号に応じて上記レーザーダイオードをパルス的に発光させる電流供給手段を上記光ヘッドに設けたことを特徴とするレーザー駆動装置。
【請求項３】レーザーダイオードの発光量を所定量に制御する手段を基板上に設けたことを特徴とする請求項１又は２記載のレーザー駆動装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は記録可能な光ディスク装置におけるレーザー駆動装置に関する。
【０００２】
【従来の技術】近年、ＣＤ－Ｒのような、記録可能な光ディスクおよびこれに対し記録再生を行う光ディスクドライブの普及が目覚ましい。レーザー駆動装置は、レーザーダイオードのパワーを制御しながらレーザーダイオードに記録電流パルスを供給する、上記光ディスクドライブにおけるキーデバイスとして不可欠なものである。以下従来のレーザー駆動装置について簡単に説明する。
【０００３】まず、光ヘッド内にはレーザーダイオードと、その発光量をモニターするフォトダイオードが設けられていて、このレーザーダイオードに所定のレーザー駆動電流を流せば、レーザーダイオードは発光し、その発光量に比例してフォトダイオードからは検出電流が流出する。レーザーダイオードはもともと温度に対して敏感で、同じ駆動電流を流しても、温度条件によって異なる光量で発光する。そこで上記フォトダイオード出力電流を用いて発光量をフィードバック制御（いわゆるレーザーパワー制御）している。

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【０００４】たとえば上記帰還電流を抵抗に流し込んで電流電圧変換し、この電圧（モニタ電圧）と目標電位、すなわちレーザーダイオードが所望の光量で発光しているならば得られるであろう電位、との誤差に応じて上記レーザー駆動電流を加減する。その結果、制定状態において、光量検出電位と目標電位が等しくなる、言い換えればレーザーダイオードが所望の光量で発光するようにフィードバック制御される。
【０００５】目標電位は再生、記録それぞれにおいて適宜切り換えられる。つまり、光ディスクから情報を再生する場合は、比較的弱い光量でレーザーを定常的に発光させ、また、光ディスクに情報を記録する場合は、強い光量でパルス的に発光させる。したがって、記録・再生時において所望の光量になるべく、目標電位をそのつど切り換える。なお、記録時にはパルス発光に応じて検出される上記モニタ電圧のピークをサンプルホールドし、これと上記目標電位を比較するなどして、パルス発光瞬時のパワーを制御している（例えば、実開平４－１０３３１９号公報）。
【０００６】
【発明の解決しようとする課題】しかし、従来の構成ではレーザーダイオードとフォトダイオード以外の殆どの構成要素は光ヘッド外の基板上に設けざるを得ず、特にレーザーダイオードを高速にパルス発光させることが困難であった。すなわち、高精度なパワー制御を実行する上記レーザー駆動装置を実現するためにはそこそこの回路部品が必要であり、形状が限られた光ヘッド上に配置するのが困難であるのに加え、レーザーダイオードに駆動電流を流し込むためには駆動電流源が必要であり、この駆動電流源がそれ自身の多大な電力消費のため発熱し、これによって光ヘッドの光軸ずれなどの経時劣化が生じ、さらにはレーザーダイオードの寿命が縮むといった問題が生じる。
【０００７】故に、上記駆動電流源を含む回路の大部分は独立した基板上に設けざるを得ないが、上記回路を光ヘッド外に設ける場合、光ヘッド上のレーザーダイオードおよびフォトダイオードとを、長いケーブルで結線しなければならない。つまり、一般に光ヘッドは移送（トラバース）モーター上に設けられていて、光ディスク内外周にわたって任意に移動できるようになっているが、上記基板と光ヘッドの位置関係が常に変化することになるから、両者を接続するケーブルは十分余裕ある長さを必要とする。例えばＣＤ－Ｒドライブの場合、１０ｃｍ程度を必要とする。
【０００８】ところが、レーザーダイオードを所定パワーで発光させるためには１００ｍＡ程度の大電流が必要であり、さらに、上記の構成では、光ディスクに情報を記録する際、駆動電流源からパルス状のスイッチング電流が上記ケーブルを介してレーザーダイオードに供給さ

れることになるため、ケーブルの容量および誘導特性により、パルス波形を忠実に伝送するのが高速になるほど難しくなる。

【０００９】

【課題を解決するための手段】上記課題を解決するために、請求項１の発明のレーザー駆動装置は、光ヘッドに設けられたレーザーダイオードに、記録信号に応じてパルス状に変化する駆動電流を供給し、所定の光量でパルス発光させるレーザー駆動装置であって、上記光ヘッドに、上記上記駆動電流のうち高域成分を供給する高域電流供給手段を設け、上記光ヘッドとケーブルで接続された基板に、上記駆動電流のうち低域成分を供給する低域電流供給手段を設け、上記駆動電流の高域成分と低域成分は光ヘッドにおいて加算合成され上記レーザーダイオードに供給されることを特徴としたものである。

【００１０】また、請求項２の発明は、光ヘッドに設けられたレーザーダイオードに、記録信号に応じてパルス状に変化する駆動電流を供給し、所定の光量でパルス発光させるレーザー駆動装置であって、上記光ヘッドとケーブルで接続された基板に、このケーブルに上記記録信号を並列信号として伝送させる手段を設け、また、上記並列信号を直列信号に変換する並列直列変換手段を上記光ヘッドに設け、上記並列直列変換手段より出力される直列信号に応じて上記レーザーダイオードをパルス的に発光させる電流供給手段を上記光ヘッドに設けたことを特徴としたものである。

【００１１】

【発明の実施の形態】以下、請求項１の発明の実施形態について説明する。図１は請求項１の発明の実施形態のブロック図である。図１において光ヘッド１上にはレーザーダイオード１０１およびフォトダイオード１０２が、さらに高域電流駆動手段１０４、ハイパスフィルター１０３が設けられている。基板２上には低域電流駆動手段２０１その他の構成要素が設けられている。光ヘッド１と基板２はケーブル３で接続されている。特に図示してはいないが、光ヘッド１はトラバースモーターによって、光ディスク内外周にわたって任意に移動できる構成になっている。

【００１２】まず、再生時（ＲＷ＝Ｌ）において、定常的にレーザーを発光させる機能について説明する。基板側に設けられた低域電流駆動手段２０１の出力電流ＩＬはケーブル３を通ってレーザーダイオード１０１に供給される。ここで低域電流駆動手段２０１は入力信号に応じた電流を発生する、例えばオープンコレクタ出力を有すバイポーラ素子等によって構成される。レーザーダイオード１０１は電流ＩＰ（＝ＩＬ）に応じた光量で発光し、光ディスク媒体記録面を照らす。発光の一部はフォトダイオード１０２で電流変換され、光量検出電流ＩＢとしてケーブル３を通って基板２上に設けられた電流電圧変換器２０２によって電圧（モニタ電圧）に変換される。モニタ電圧は包絡線検出器２０３を経て目標電位ＶＲ（レーザーダイオードが所望の光量で発光しているならば得られるであろうモニタ電圧と等しい電位）と誤差演算手段２０５で比較され、その誤差分がループフィルター２０４を介して低域電流駆動手段２０１に帰還される。その結果定常状態において光量検出電位と目標電位とが等しくなり、レーザーダイオードは所望の光量で発光する。ループフィルター２０１は通常は１次の積分特性を有すアクティブフィルター等で構成される。

【００１３】一方、記録時（ＲＷ＝Ｈ）には記録ゲート２０６が開き、記録すべき情報を含んだデジタルパルス信号ＤＴＰが変調器からドライブアンプ２０８に供給される。ドライブアンプ２０８は例えばＣＭＯＳスイッチングデバイスなどで構成された電圧出力のアンプである。ドライブアンプ２０８出力信号はケーブル３を経て、光ヘッド１上に設けられた高域電流駆動手段１０４に供給される。高域電流駆動手段１０４はデジタルパルス信号に応じたスイッチング電流、すなわち高域駆動電流ＩＨを発生し、この電流はハイパスフィルター１０３を経てレーザーダイオード１０１に供給される。すでにレーザーダイオードには低域駆動電流ＩＬが供給されているから、電流ＩＨはこれに重畳されることになる。

【００１４】さらにデジタルパルス信号ＤＴＰは、ハイパスフィルター１０３と同じカットオフ周波数を持つローパスフィルター２０９を経て低域電流駆動手段２１０に供給され、その電流出力は低域電流駆動手段２０１電流出力に重畳して、低域駆動電流ＩＬとなってレーザーダイオード１０１に供給される。

【００１５】本実施形態が再生動作から記録動作へ、あるいは記録動作から再生動作へ切り替わるときの様子を図２に示す。ハイパスフィルター１０３通過後の高域駆動電流ＩＨは記録動作を開始した直後は±０［アンペア］から所定の電流ΔＩＨに立ち上がるが、直流を含む低域成分がカットされているため、時間がたてばデジタルパルス信号ＤＴＰに応じて±ΔＩＨ／２の範囲で変化する交流電流になる。一方、低域電流駆動手段２１０からはデジタルパルス信号ＤＴＰの低域成分に応じた電流が出力される。言い換えればハイパスフィルター１０３でカットされたデジタルパルス信号ＤＴＰの低域電流成分を補うような電流が供給される。その結果レーザーダイオード１０１に供給される電流ＩＰ（＝ＩＨ＋ＩＬ）は図示されるように再生時の直流電流（ＩＲ）にデジタルパルス信号に対応したパルス電流成分ΔＩＨが加算されたもの（ＩＷ）になり、レーザーはパルス的に高パワー発光し、光ディスク媒体に対して記録が実行されることになる。

【００１６】このときの発光量に応じた電流ＩＢがフォトダイオード１０２によって検出され、この電流ＩＢは電流電圧変換器２０２によってモニタ電圧信号に変換された後、包絡線検出手段２０３によってその包絡線い

わゆるエンベロープが検出される。ここで、包絡線検出手段２０３は、たとえば、ダイオードを用いた整流回路またはデジタルパルス信号ＤＴＰのエッジに応じてピーク値をサンプルホールドする回路によって実現される。包絡線検出手段２０３出力信号は誤差検出手段２０５によって目標値ＶＲと比較されるが、この目標値は、目標値切り替え手段２０７によって、再生時（ＲＷ＝Ｌ）と記録時（ＲＷ＝Ｈ）でそれぞれＶＲＲ、ＶＲＥ、と切り替わる。すなわち、レーザーダイオードが、再生時は所定の低パワーで、記録時はパルスピークが所定の高パワーで、発光するようなフィードバック制御が実行される。

【００１７】以下、本実施形態の効果について図３を参照しながら説明する。図３はレーザーダイオード１０１の電流－発光パワー特性である。レーザーダイオード１０１は常に供給される電流に応じて発光するわけではなく、しきい値電流（ＩＴＨ）を越えないと発光しない。つまり、実用的観点からすれば、しきい値電流は単に電力を消費するだけ、つまり発熱に寄与するだけのものである。本実施形態ではこのしきい値電流ＩＴＨを含む低域電流ＩＬを基板２側に設けられた低域電流駆動手段２０１、２１０より供給している。具体的には低域電流値は５０ｍＡ程度である。記録時にはさらにパルス電流を注入してレーザーダイオードを瞬時的に高パワー発光させるが、これに必要な電流増分ΔＩＨのみ、ヘッド１上に設けられた高域電流駆動手段１０５が供給する。具体的には、電流増分ΔＩＨは２０ｍＡ程度である。言い換えれば、高域電流駆動手段１０４は単に上乗せ分の電流を消費するのみであり、高域電流駆動手段１０４のみを光ヘッド１側に設けたことにより、光ヘッド１の発熱は最小限に抑えられる。

【００１８】さらに、いうまでもなく、本実施形態によれば、記録時における高速パルス電流はレーザーダイオードに近接した高域電流駆動手段１０４から直接供給されるため、記録周波数が高くなってもパルス波形を維持したままレーザーダイオードを高速パルス発光させることができる。

【００１９】以上のように本実施形態によれば、光ヘッドの温度を過度に上昇させることなく、記録速度を容易に向上させることができる。

【００２０】なお、本実施形態において、再生時と記録時のレーザーパワー制御を、単一の制御系を用いて、単に目標値ＶＲを切り替えることによって実行するものとしたが、本発明の効果はこれに限定されるものではない。たとえば、再生時の定常発光を制御する制御系と、記録時のパルス制御を実行する制御系を独立に設けたものであってもよい。また、記録時には制御系をホールド状態にするものであってもよい。

【００２１】また、本実施形態において、レーザーパワーの切り替えを、再生時と記録時、単に２段階とした

が、相変化媒体を用いた書き換え型光ディスク装置の場合、さらに消去パワーを加えた３段階切り替えが必要である。しかしこういった場合においてもレーザー駆動電流信号の高域成分と低域成分を分離し、高域電流駆動手段のみを光ヘッド上に設けるといった本実施形態の構成が可能であり、本実施形態と同等な効果が得られるはずである。

【００２２】以下請求項２の発明の実施形態について説明する。図４は請求項２の発明のレーザー駆動装置のブロック図である。図４においてレーザーダイオード１０１、フォトダイオード－１０２、ハイパスフィルター１０３、高域電流駆動手段１０４、低域電流駆動手段２０１、２１０、電流電圧変換器２０２、包絡線検出手段２０３、ループフィルター２０４、誤差演算手段２０５、記録ゲート２０６、目標値切換手段２０７、およびローパスフィルター２０９は図１で示されたものと同等な機能を有す。本実施例で異なるのは基板２０上に直列並列変換器２２１およびクロック分周器２２２を、ヘッド１０上に並列直列変換器１１１およびクロック逓倍器１１２を設けたことにある。

【００２３】先述の実施形態では、レーザー駆動電流のパルス成分は高域電流駆動手段１０４が供給しているので、ケーブルを介してレーザーダイオード１０１を駆動することは無いが、図１におけるドライブアンプ２０８は少なくともケーブルを高周波でドライブできるだけの負荷能力が必要である。そこで本実施例では記録信号を並列転送することによって１ライン当たりの転送周波数を下げ、実質的に負荷を軽減している。デジタルパルス信号ＤＴＰは直列並列変換器２２１によって４ビットの並列データに置換される。またクロックＣＬＫはクロック分周器２２２によって４分周される。ケーブル３０には周波数が１／４になったデータが通過する。一方、ヘッド１０においては並列直列変換器１１１が上記４ビット並列データを直列に変換し、高域電流駆動手段１０４に供給する。変換に要するクロックは上記４分周クロックをクロック逓倍器１１２で４逓倍して得られる。

【００２４】クロック逓倍器１１２はたとえば４分周カウンタを有したＰＬＬ回路で構成される。上記並列直列変換器１１１およびクロック逓倍器１１２（ＰＬＬ）は一般に小規模なＣＭＯＳデジタル回路で構成することが可能である。さらに先の実施形態でも述べたように、高域電流駆動手段１０４は単にスイッチング（交流）電流を供給するだけであるから低域電流駆動手段２０１のようなバイポーラ構成の定電流源である必要は無い。よって、これをＣＭＯＳスイッチング素子で構成し、上記並列直列変換器１１、クロック逓倍器１１２とともにＩＣ化すれば、ヘッド１０上の限られたスペースに設けることが十分可能となる。

【００２５】以上、本実施形態によればケーブル３０を通過する信号の周波数を低減することができ、ケーブル

の実効負荷を軽減することができる。その結果、さらに高速な信号を記録することが可能となる。

【００２６】なお、本実施例において、直列のデジタルパルス信号ＤＴＰを並列に変換するとあるが、デジタルデータはもともと８ビット単位の並列で処理されるので、わざわざ直列並列変換せずとも、並列データをそのまま出力するものであってもよい。ただし、この場合においても光ヘッド１０上における並列直列変換器１１１は必要である。

【００２７】

【発明の効果】以上のように請求項１の発明によれば、光ヘッド上に高域電流駆動手段を、光ヘッドとケーブルで結ばれた基板上に低域電流駆動手段を、それぞれ設け、それぞれが光ディスク媒体に記録すべきデジタルパルス信号の低域成分および高域成分に応じた電流を供給するようにしたことによって、光ヘッドの温度上昇を最小限に抑えつつ、記録速度を上げることが可能となる。

【００２８】また、請求項２の発明によれば上記ケーブルを伝送する信号の周波数を低減させることができ、さらに記録速度を上げることが可能になる。

【図面の簡単な説明】

【図１】本発明の第１の実施例のブロック図

【図２】本発明の第１の実施例の動作を示すタイミングチャート

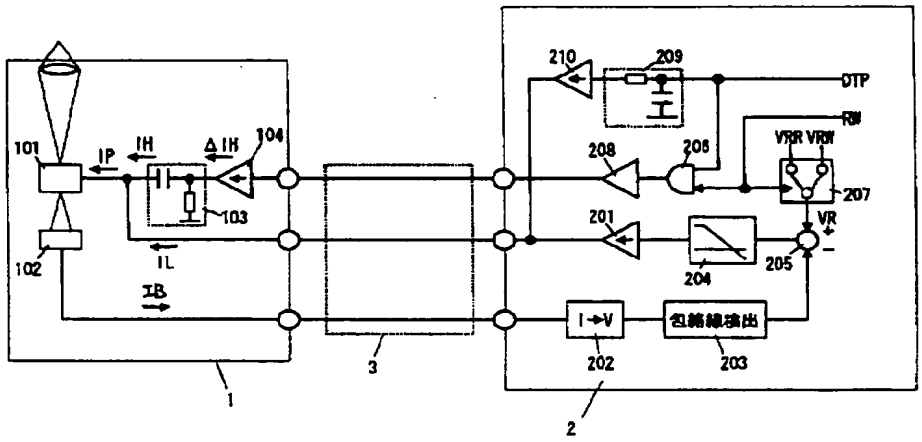
【図３】本発明の第１の実施例の効果を示す特性図

【図４】本発明の第２の実施例のブロック図

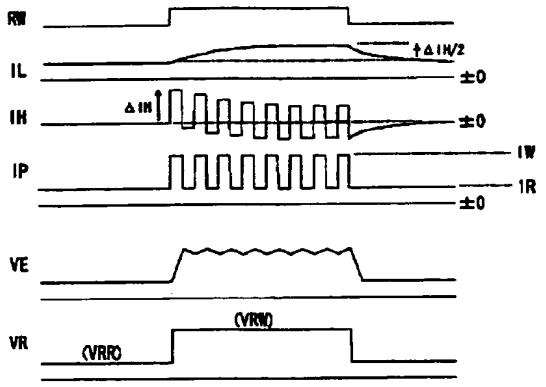
【符号の説明】

１，１０　光ヘッド
２，２０　基板
３，３０　ケーブル
１０１　レーザーダイオード
１０２　フォトダイオード
１０３　ハイパスフィルタ
１０４　高域電流駆動手段
１１１　並列直列変換器
１１２　クロック逓倍器
２０１，２１０　低域電流駆動手段
２０２　電流電圧変換器
２０３　崩落線検出手段
２０４　ループフィルタ
２０９　ローパスフィルタ
２２１　直列並列変換器
２２２　クロック分周器

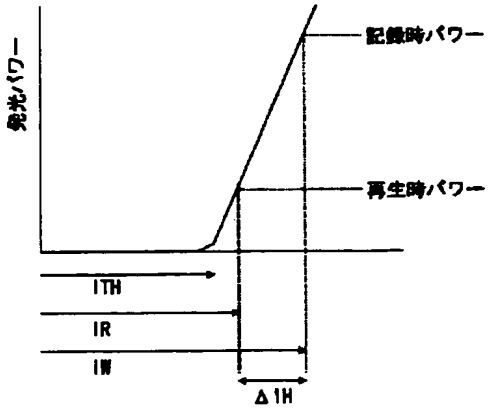
【図１】



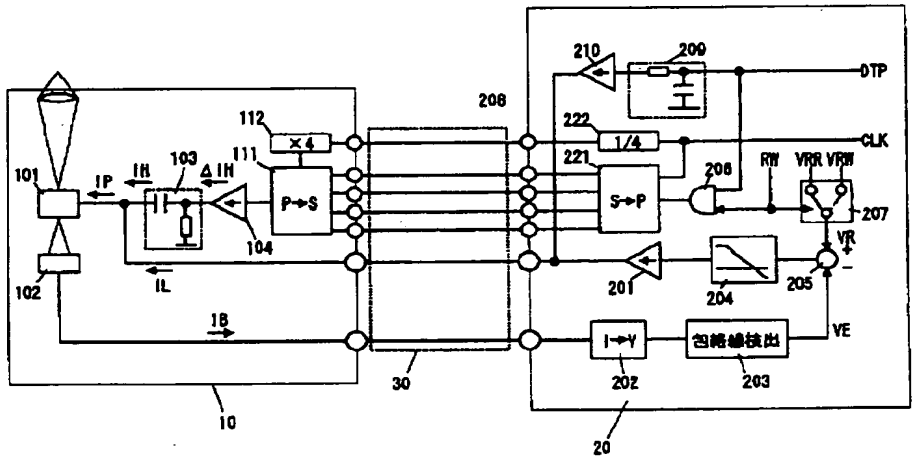
【図２】



【図３】



【図４】



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